

ACCESSION #: 9104180309

LICENSEE EVENT REPORT (LER)

FACILITY NAME: D. C. Cook Nuclear Plant - Unit 2

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DOCKET NUMBER: 05000316

TITLE: Reactor Protection System Actuation Due to Ice and Snow Damaging  
Off-Site Electrical Transmission Lines

EVENT DATE: 03/13/91 LER #: 91-004-00 REPORT DATE: 04/12/91

OTHER FACILITIES INVOLVED:

DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: P. F. Carteaux - Safety and  
Assessment Superintendent

TELEPHONE: (616) 465-5901

COMPONENT FAILURE DESCRIPTION:

CAUSE: SYSTEM: COMPONENT: MANUFACTURER:  
REPORTABLE NPRDS:

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On March 13, 1991 at 0651 hours, the Unit 2 reactor tripped as a result of a turbine trip generated by a moisture separator-reheater (MSR) high water level trip. The turbine-generator trip and reactor trip were a result of off-site electrical transmission system disturbances. Ice and snow damaged 765 KV transmission lines which caused a significant load rejection on the main turbine. The closing of the main turbine control valves in response to the load rejection created a MSR pressure transient which actuated the MSR high water level trip and tripped the main turbine and reactor. The plant was stabilized in Mode 3.

Abnormalities noted during the event included the electronic overspeed trip of the turbine driven auxiliary feedwater pump, closure of one of the four main steam isolation valves, and apparent slow closure of the #4 combined intercept valve. All equipment malfunctions were reviewed with no unreviewed safety questions and the reactor bus returned critical on March 15, 1991 at 1113 hours.

END OF ABSTRACT

TEXT

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Conditions Prior to Occurrence

Unit 2 in Mode 1 at 100 percent of Rated Thermal Power (RTP).

Description of Event

On March 13, 1991 at 0651 hours, the Unit 2 reactor (E11S/JE) tripped as a result of a turbine (E11S/TA) trip generated by a moisture separator-reheater (MSR) (E11S/SB-MSR) high water level trip. The turbine-generator trip and reactor trip were a result of off-site electrical transmission system disturbances. Ice and snow damaged 765 KV

transmission (E11S/FK) lines which caused a significant load rejection on the main turbine (greater than 50% steam flow with no load). The closing of the main turbine control valves (E11S/TA-FCV) in response to the load rejection created a Moisture Separator-Reheater (MSR) pressure transient which actuated the MSR high water level trip and tripped the main turbine and reactor. The time from the most severe electrical transient to the MSR high level trip was 11.5 seconds.

The main turbine control system (E11S/TA-HCU) includes a speed governor driven by gears in the front standard and receives inputs from the load limiter, operating device, acceleration limiter, steam pressure limiter, and control valve position feedback. The acceleration limiter (E11S/TA-SC0) prevents the turbine from tripping on overspeed on a load rejection by reacting more quickly than the governor and thereby limiting the maximum speed reached by the turbine. If the turbine acceleration reaches 47 RPM per second, corresponding to a 50% load rejection, the acceleration limiter will close the high pressure control valves and low pressure intercept valves.

It is believed that the 765 KV line disturbances, prior to the turbine trip, caused a significant load rejection and actuated the acceleration limiter. The unequal closing times of the control valves and intercept valves created a MSR pressure transient which lifted the MSR safety valves and actuated a 5-second time delayed MSR high level trip.

Following the turbine trip/reactor trip sequence, [turbine (E11S/TA-TRB) trip, opening of the reactor trip breakers (E11S/JE-BKR), insertion of reactor control rods (E11S/AA-ROD), feedwater isolation (E11S/JB), and automatic starting of the motor driven auxiliary feedwater pumps (E11S/BA-P)], Operations personnel immediately implemented Emergency operating Procedure 2 OHP 4023.E-0 to verify proper response of the automatic protection system and to assess plant conditions for indicated appropriated recovery actions.

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Following the main generator trip and transfer to reserve feed (E11S/FK), the 345 KV bus provided a stable power supply for the unit 2 auxiliary loads. A review of fault records for Unit 1 showed system upsets to a lesser degree, as it was not directly linked to the 765 KV bus.

Abnormalities noted during the event included the electronic overspeed trip of the turbine driven auxiliary feedwater pump (E11S/BA-P), closure of one of the four main steam isolation valves (E11S/SB-ISV), and slow closure of the #4 combined intercept valve (E11S/SB-ISV). The turbine driven auxiliary feedwater pump was immediately reset and placed in standby. The main steam isolation valve was believed to have drifted shut and was reopened within minutes of the trip. The #4 combined intercept slow closure has been attributed to an indication problem and not valve inoperability.

#### Cause of Event

The cause of the event was ice and snow damaging 765 KV off-site electrical transmission lines resulting in an electrical disturbance beyond the control capability of the unit.

#### Analysis of Event

This report is being submitted in accordance with 10 CFR 50.73, paragraph (a)(2)(iv), as a event that resulted in an unplanned automatic actuation of the Engineered Safety Features, including the Reactor Protection System.

The automatic protection responses, including reactor trip and its associated actuations were verified to have functioned properly as a result of the reactor trip signal. The electronic overspeed trip of the Turbine Driven Auxiliary feedwater pump was immediately reset from the control room and it is believed that the pump would have been available if required. The Main Steam Isolation Valve, which drifted shut, was reopened within minutes of the trip. The slow closure of the combined intercept valve was attributed to a limit switch which did not reflect actual valve position. Based on the above, it is concluded that the event did not constitute an unreviewed safety question as defined in 10 CFR 50.59 (a)(2) nor did it adversely impact the health and safety of the public.

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#### Corrective Actions

##### Turbine Driven Auxiliary Feedwater PUMP (TDAFP)

The cause of the TDAFP electronic overspeed trip could not be conclusively determined. A thorough review of the event and extensive testing did not reveal the reason for the overspeed event. Post trip testing included:

- o measurement of the as found electrical trip
- o inspection of the governor valve linkage and stem for binding or corrosion
- o inspection of the governor oil for water contamination
- o inspection of steam traps on the steam supply piping
- o a functional test of the TDAFP electronic overspeed.

All tests and inspections were normal.

##### Main Steam Isolation Valve (MSIV) Closing

A review of past Unit 1 and Unit 2 trips showed several cases where MSIVs drifted off their open seats, as was the case on this particular trip with MSIVs #21 and #22. This was the first trip identified where a MSIV closed completely, but given the secondary transient experienced, it is not considered unusual that this would occur.

##### Combined Intercept Valve #4

The Combined Intercept Valve #4 appeared to slow close over a 5 minute period as indicated by an intermediate valve position and the fact that the Turbine Events Recorder did not register the valve as being closed. As a condition to restart, the valve was timed in the closed direction and yielded a value of 1.2 seconds. It is believed that a single limit switch did not initially close. This limit switch would keep the open light lit and prevent the Turbine Events Recorder from indicating a closed position.

##### Failed Component Identification

None

##### Previous Similar Events

None

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AEP  
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April 12, 1991

United States Nuclear Regulatory Commission  
Document Control Desk  
Rockville, Maryland 20852

Operating Licenses DPR-74  
Docket No. 50-316

Document Control Manager:

In accordance with the criteria established by 10 CFR 50.73 entitled  
Licensee Event Reporting System the following report is being submitted:

91-004-00

Sincerely,

A. A. Blind  
Plant Manager

AAB: sb

Attachment

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